Toyota Engines

4K-C 4-CYLINDER

ENGINE CODING

ENGINE IDENTIFICATION

Engine serial number and code are stamped on right side of block above oil filter. First 3 digits are engine code.

ENGINE IDENTIFICATION

Application	Code
Starlet	4K-C

ENGINE, MANIFOLDS & CYLINDER HEAD

ENGINE

Engine removal and installation procedures for Starlet models were not available from manufacturer.

INTAKE & EXHAUST MANIFOLDS

Removal

1) Remove air cleaner. Disconnect fuel and vacuum lines at carburetor. Disconnect choke and throttle linkage at carburetor.

2) Remove heat insulator, PCV valve and PCV hose. Disconnect exhaust pipe at manifold. Remove manifold retaining nuts and bolts and take off manifold assembly.

Installation

To install, reverse removal procedure, ensuring that mating surfaces are clean and new gaskets are used. Torque 2 center bolts first, then top front, bottom rear, bottom front and top rear in that order.

CYLINDER HEAD

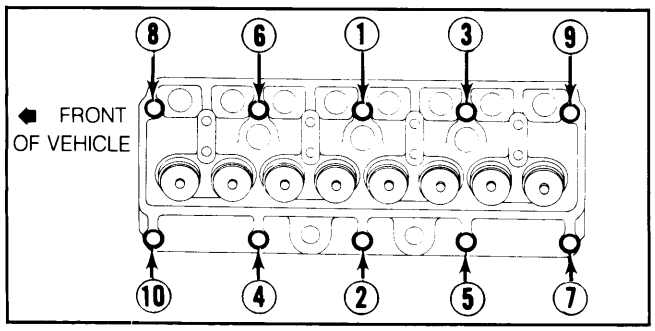
Removal

1) Drain cooling system and remove upper radiator hose. Remove intake-exhaust manifold assembly as previously outlined. Disconnect heater hose at rear of head. Remove valve cover.

2) Loosen rocker arm support bolts in 3 or 4 steps. Follow sequence of front, rear, front center and rear center bolt.

3) Remove bolts and shaft assembly. Remove push rods and keep in order for reassembly in original position. Disconnect spark plug wires. Loosen and remove head bolts in 2 or 3 steps in reverse of tightening sequence. *See Fig. 1.* Lift head from engine.

Fig. 1: Cylinder Head Tightening Sequence



Remove in reverse order of tightening sequence.

Installation

1) Ensure that mating surfaces are clean. Install new gasket with "FRONT" side facing up. Continue assembly in reverse order of removal. Tighten head bolts gradually in 2 or 3 steps in sequence shown in *Fig. 1.*

2) Install push rods and rocker shaft assembly. When installing rocker shaft assembly, be sure adjusting screws are backed off about 2 turns. Tighten rocker support bolts in 3 or 4 steps. Adjust valves. See Valve Clearance.

CAMSHAFT

FRONT COVER OIL SEAL

Removal

Remove all fan belts. Remove crankshaft pulley center bolt. Using gear puller, remove crankshaft pulley. Being carefull not to damage crankshaft, pry out old seal.

Installation

Coat the lip of the new seal with multipurpose grease. Using seal driver, install new oil seal. Reverse removal procedure to complete installation.

TIMING CHAIN & GEAR

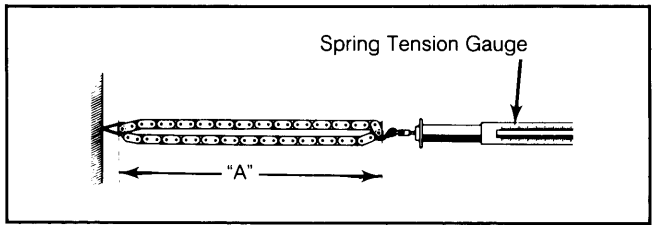
Checking for Stretch

1) With timing chain installed on engine, attach a spring scale to chain. Pull out on chain with pressure of 22 lbs. (10 kg). If distance between chain tensioner plunger and tensioner body exceeds .531" (13.5 mm), chain and sprockets must be removed and checked.

CAUTION: When checking distance between tensioner plunger and body, note thickness of tensioner head. If tensioner head is worn beyond limits, measurement will be inaccurate. See Timing Chain Tensioner.

2) Timing chain may be checked off the engine. Secure 1 link of timing chain and attach spring tension gauge to opposite end. *See Fig. 2.*

Fig. 2: Checking Timing Chain Elongation



Maximum distance "A" is 10.7" (272 mm).

3) With 11 lbs. (5 kg) tension applied to chain, distance "A" should be no more than 10.7" (272 mm). If distance is more than specified, replace chain.

Removal

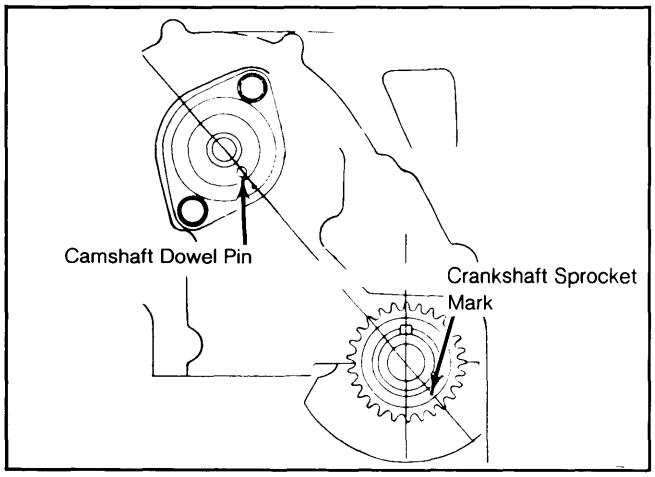
1) Remove camshaft sprocket bolt and remove sprocket and chain. Pull crankshaft sprocket from crankshaft. Check sprockets for wear.

2) Wrap chain completely around crankshaft sprocket. Measure outside diameter of rollers with a Vernier caliper. If less than 2.34" (59 mm), replace sprocket. Measure camshaft sprocket in the same manner. If less than 4.48" (114 mm), replace sprocket.

4K-C 4-CYLINDER (Cont.)

3) To correctly install sprockets and timing chain, set No. 1 piston to TDC of compression stroke. Align camshaft dowel pin with mark on thrust plate. Align chain timing marks with those on sprockets. *See Fig. 3.*

Fig. 3: Aligning Marks for Timing Chain and Sprocket Installation



No. 1 piston set to TDC of compression stroke.

4) Install timing chain and sprockets together. Apply a light coat of oil to camkshaft sprocket bolt and tighten. Install chain tensioner and vibration damper. Install timing chain cover and crankshaft pulley.

TIMING CHAIN TENSIONER & DAMPER

1) Inspect surfaces of tensioner plunger and bore of tensioner body. To test clearance, lubricate plunger and insert it into plunger body. Cover two oil passages with fingers and pull plunger about half way out. Vacuum strong enough to return plunger should be felt.

2) Measure thickness of tensioner head and chain damper wall. Head should be minimum .47" (12 mm) and chain damper should be minimum .28" (7 mm).

CAMSHAFT

Removal

1) Remove timing chain and sprockets. See Timing Chain. Take off camshaft thrust plate. Remove front end plate from engine block.

2) Remove cylinder head, valve lifters and distributor. See Cylinder Head. Pull camshaft straight out, using care not to damage bearings or journals.

3) Check camshaft runout at number 2 journal by using a dial indicator. Maximum runout limit is .0012" (.03 mm), and maximum journal out-of-round or taper is .0008" (.02 mm).

Installation

After installing camshaft, set valve timing. See Timing Chain. Install cylinder head with new gasket. See Cylinder Head. Reverse removal procedure to complete assembly.

CAMSHAFT END THRUST

With sprocket installed, check clearance between thrust plate and first bearing journal. If clearance exceeds .012" (.3 mm), replace thrust plate. If clearance is still excessive after replacing thrust plate, it will be necessary to replace the camshaft.

CAM LOBE HEIGHT

Total height of camshaft lobe is 1.436-1.440" (36.47-36.57 mm) for intake lobe. Height of exhaust lobe is 1.432-1.436" (36.37-36.47 mm). If less than 1.424" (36.17 mm) for intake or 1.420" (36.07 mm) for exhaust lobes, replace camshaft.

CAMSHAFT BEARINGS

Removal

1) To replace bearings, remove expansion plug from rear of engine. Use bearing replacement tool (09215-22010) to remove old bearings and insert new ones. Measure camshaft journal diameter and subtract from measured diameter of bearing bore to determine clearance.

2) Bearings should be replaced if clearance exceeds .004" (.1 mm). Journals may be ground and .005" (.125 mm) or .010" (.250 mm) undersized bearings installed if necessary.

Installation

Oil holes in bearings must be aligned with oil holes in cylinder block. Install new expansion plug, coated with sealer, when all bearings have been installed.

VALVES

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E (Front-to-rear).

ROCKER ARM ASSEMBLY

Disassembly

1) Remove valve cover. Remove rocker arm assembly retaining bolts in 3 or 4 steps. Loosen in sequence of front, rear, front center and rear center bolts. Remove rocker arm assembly.

2) Remove retaining clips from both ends of rocker arm shaft. Keeping in order for reassembly, remove conical springs, rocker arms, springs and support stands

3) Thoroughly clean and inspect all components. Check rocker arm-to-shaft clearance. If clearance exceeds .0024" (.061 mm), replace rocker arms or shafts as necessary. Reface valve end of rocker arm if worn. Lubricate all components before assembly.

Reassembly

1) Assemble rocker arm assembly in reverse order of disassembly. Install rocker arm so that protruding side of valve end of rocker arm faces support stand.

2) Torque rocker support bolts in 3 or 4 steps. Tighten in following sequence: Rear center, front center, rear and front.

VALVE SPRINGS

Removal

Use compressor (09202-43012) to compress valve springs and retainers. Remove valve spring retainer locks (keepers), then remove retainer, spring, seal and washer. Mark and remove valves and components for reassembly.

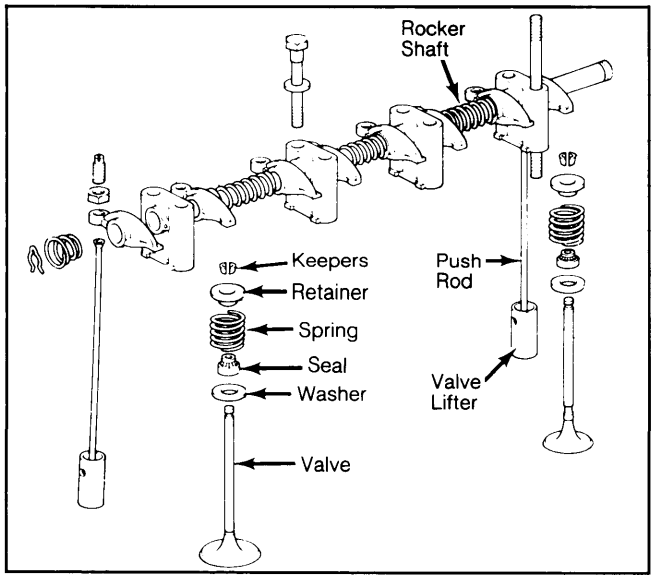
Installation

Install components in original location and order. Use new seals on valve stems. Compress springs and install keepers.

4K-C 4-CYLINDER (Cont.)

NOTE: Some engines may have a spring shield under retainer and "O" ring seal on valve stem above keepers.

Fig. 4: Exploded View of Valve Train Components



VALVE SPRING INSTALLED HEIGHT

1) With valve spring removed, check length under specified load (see specifications) in a spring tester. Check free length. If less than 1.83" (46.5 mm), replace valve spring.

2) Check valve spring squareness with a steel square. If spring is out of square more than .063" (1.6 mm), replace spring.

VALVE STEM LENGTH

Valve stem tips may be resurfaced on a valve grinder. DO NOT grind more than .020" (.5 mm). Standard intake valve length is 3.933" (99.9 mm). Exhaust valve length is 3.941" (100.1 mm).

VALVE GUIDE SERVICING

1) Measure valve guide inner diameter and valve stem outer diameter. If clearance exceeds .003" (.08 mm) for intake or .004" (.10 mm) for exhaust valves, replace valves and/or guides.

NOTE: Cylinder head should be heated to about 212°F (100°C) before removal or replacement of valve guide.

2) To replace valve guide, break off upper portion of guide at snap ring. Drive remaining portion of guide out of head through combustion chamber with driver (09201-60011).

3) Install snap ring on guide and install from top with driver. Drive in until snap ring contacts head. Guide projects .07" (18 mm) when properly installed. Ream guide for proper stem clearance.

NOTE: Oversize guides .002" (.05 mm) larger than original guides are available if required to obtain proper fit between guide and head.

VALVE LIFTERS

1) Check clearance between valve tappet and bore in crankcase. If clearance exceeds .004" (.1 mm), replace tappet with an oversize tappet.

2) Oversize tappet is .002" (.05 mm) over standard. Ream bore in crankcase until clearance of .0006-.0020" (.015-.029 mm) is obtained.

VALVE CLEARANCE ADJUSTMENT

1) Engine should be at normal operating temperature for valve adjustment. Set 1 cylinder at TDC on compression stroke.

2) Adjust clearance on No. 1 and No. 3 exhaust valves and No. 1 and No. 2 intake valves. Rotate crankshaft one revolution (360°) and adjust remaining valves.

VALVE CLEARANCE SPECIFICATIONS

Application	In. (mm)
Intake	.008 (.20)
Exhaust	.012 (.30)

PISTONS, RINGS & PINS

PISTON & ROD ASSEMBLY

NOTE: Remove ridge from top of cylinder bore before removing pistons.

Removal

1) With engine out of vehicle, remove cylinder head and oil pan. Mark each connecting rod and mating cap for reassembly.

2) Remove connecting rod cap and place a short length of hose over rod bolt to prevent damage to crankshaft.

3) Push piston and connecting rod assembly up and out through top of block. Mark piston to insure that it is installed in same cylinder.

Installation

1) To install piston and rod assembly, make sure ring gaps are in correct position. See Fitting Rings. Coat piston and rings with oil.

2) Compress piston rings with a ring compressor and install piston and rod assembly in crankcase with notch in piston facing front of engine. Apply oil to crankshaft journals. Make sure bearings are properly seated in connecting rod and cap.

3) Install connecting rod cap in correct position and torque nuts to specifications. Install cylinder head, oil pan and engine as previously outlined.

FITTING PISTONS

1) Measure cylinder bores in 3 places at 90° to and parallel with crankshaft. If more than .008" (.20 mm) over standard, cylinders must be rebored.

2) When reboring, finish to final dimension by honing the last .0008" (.02 mm).Pistons and rings are available in .020", .030" and .040" (.50, .75 and 1.00 mm) oversize.

3) Measure diameter of piston 1.93" (49 mm) from top of piston at 90° to piston pin. Normal clearance is

4K-C 4-CYLINDER (Cont.)

.0012-.0020" (.03-.05 mm). Check piston ring side clearance in pistons. See Fitting Rings.

PISTON DIAMETER TABLE

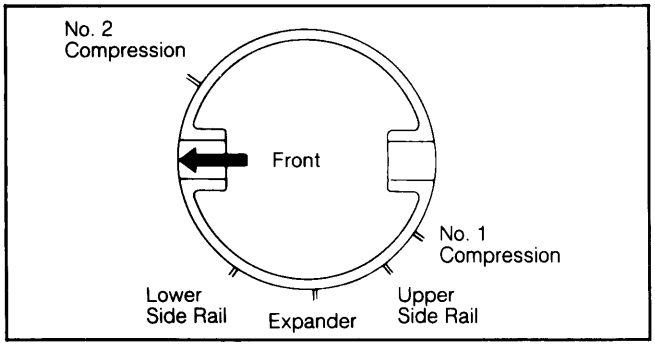
Oversized Piston	In. (mm)
.50 mm	75.46-75.51 (2.9709-2.9728)
.75 mm	75.71-75.76 (2.9807-2.9827)
1.00 mm	75.96-76.01 (2.9905-2.9925)

FITTING RINGS

1) Measure ring end gap at the lowest part of piston travel. Clean piston ring grooves and measure ring side clearance. If clearance exceeds limit, replace ring and/or piston.

2) When installing rings, the size and manufacturer marks must face upward. Position ring gaps as shown in *Fig. 5*.

Fig. 5: Arranging Piston Ring Gaps



Size & manufacturer marks must face upward.

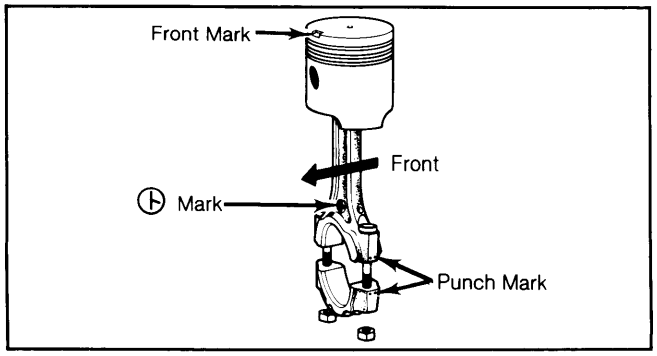
PISTON PIN REPLACEMENT

1) Check the pin fit by rocking the piston at right angle to pin. If any movement is felt, replace the piston and pin.

2) Remove circlips from pin hole in piston. Heat piston to approximately 158-176°F (70-80°C). Drive out piston pin. Make sure pins, pistons and connecting rods are marked for reassembly.

3) Thoroughly clean and inspect all components. Coat pin with engine oil and heat piston. Pin should push fit with thumb pressure through piston. If fit is too loose, replace piston and pin.

Fig. 6: Assembling Piston & Rod



Notch must face forward.

4) Check piston pin-to-connecting rod clearance. If more than .002" (.05 mm), replace bushing. Press bushing out and install new bushing with press and driver (09222-30010). Make sure to align bushing and connecting rod oil holes. Refinish new bushing with pin hole grinder.

5) Thoroughly lubricate all components before assembly. Position piston on connecting rod with notch in piston and front mark on connecting rod facing the same direction. Heat piston and install piston pin and circlips. *See Fig. 6.*

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

CRANKSHAFT MAIN BEARINGS

1) Thoroughly clean and inspect crankshaft. Blow out all oil passages with compressed air. Check crankshaft for runout at the center main bearing journal with a dial indicator. Replace crankshaft if runout exceeds limit of .0016" (.04 mm).

2) Measure main journals. If limit of .0004" (.01 mm) out-of-round or taper is exceeded, crankshaft must be reground or replaced. Main bearings are available in .002", .010", and .020" (.05, .25 and .50 mm) undersize.

3) Main bearing clearance is checked by the Plastigage method.If clearance is excessive, crankshaft must be ground to next undersize. The limit of bearing clearance on both main and connecting rod bearings is .004" (.1 mm).

4) Install bearing halves in crankcase and main bearing caps. Lubricate bearings and install crankshaft. Install main bearing caps with arrows toward front.

5) Torque cap bolts in 2 or three steps. Torque cap bolts in the following order: Bearing cap No. 3, 4, 2, 5 and 1. Install remaining components in reverse order of removal, noting proper alignment of timing marks. See Timing Chain.

CONNECTING ROD BEARINGS

1) Measure connecting rod journals. Standard diameter is 1.6526-1.6535" (41.976-41.000 mm). If taper or out-of-round exceeds .0004" (.01 mm), crankshaft must be reground or replaced.

2) Connecting rod bearings are available in .002", .010", .020" and .030" (.05, .25, .50 and .75 mm) undersizes.

3) Make sure bearing halves and crankshaft journals are thoroughly clean. Check oil clearance by Plastigage method. Install connecting rod cap and tighten nuts to specifications.

THRUST BEARING ALIGNMENT

1) Check crankshaft end play with number 3 main bearing cap and original thrust washers installed. Pry crankshaft back and forth and measure clearance with a feeler gauge.

2) Standard clearance is .002-.009" (.04-.24 mm) with a maximum limit of .012" (.3 mm). Excessive clearance may be reduced with washers .002" (.125 mm) or .004" (.250 mm) oversize. Install thrust washers with grooves toward crankshaft.

4K-C 4-CYLINDER (Cont.)

REAR MAIN BEARING OIL SEAL

Removal & Installation

1) Oil seal may be replaced with engine in vehicle and crankshaft installed. Remove transmission, clutch assembly and flywheel. *See appropriate Toyota article in CLUTCHES Section.* Remove rear oil seal retainer. Drive old seal out of retainer.

2) Drive new seal into position with tool (09250-10011). Coat seal lips with multi-purpose grease and install seal assembly. Install flywheel and torque to specifications. Install remaining components in reverse of removal procedure.

ENGINE OILING

CRANKCASE CAPACITY

The crankcase capacity is 3.7 qts. (3.5L) with filter and 3.2 qts. (3L) without filter.

OIL FILTER

The oil filter is a full flow type, mounted on outside of crankcase next to distributor.

NORMAL OIL PRESSURE

With engine at 212°F, normal oil pressure is 28.4 psi @300 RPM, 42.6 psi @3000 RPM.

OIL PRESSURE REGULATOR VALVE

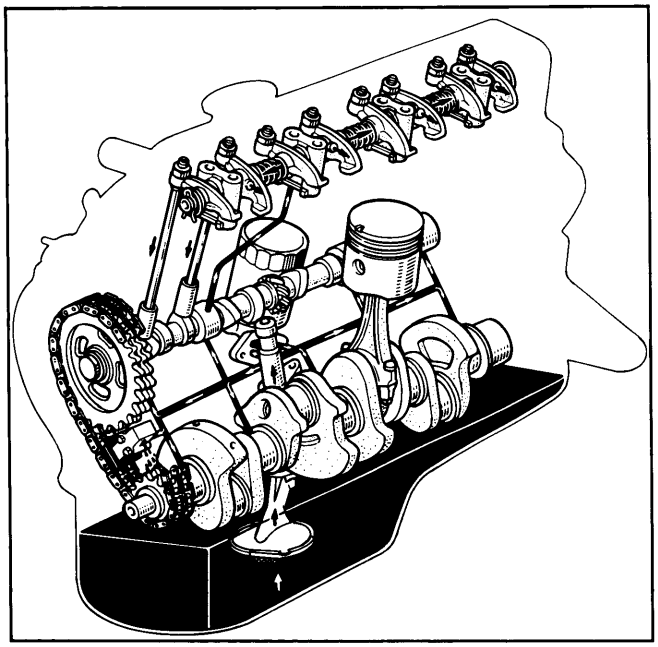
The pressure regulator valve is a non-adjustable type, mounted in oil pump.

ENGINE OILING SYSTEM

Oil is circulated through the engine by pressure provided by a trochoid rotor type oil pump. Pump is mounted on bottom of crankcase and is driven by camshaft through the distributor drive. Oil is drawn from oil pan and is circulated through a full flow oil filter into the main oil gallery. Oil is then distributed to main and connecting rod bearing journals and camshaft bearing journals.

Cylinders and piston pins are lubricated by oil squirting from hole in connecting rod. Oil is supplied to timing chain by oil from timing chain tensioner. Oil flows from number 2 cam bearing journal to rocker arm shaft to lubricate rocker arms. Excess oil from rocker arm shaft lubricates valves and valve stems.

Fig. 7: Engine Oiling System

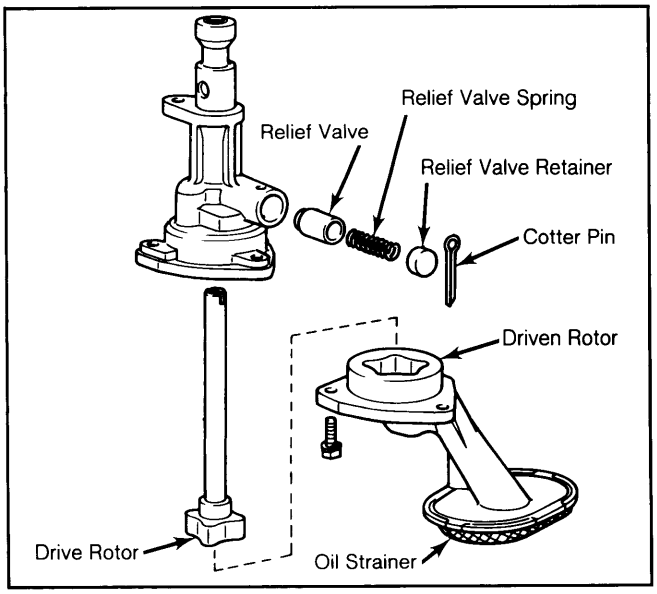


OIL PUMP

Disassembly

Remove oil strainer, pump cover and pressure regulator plug from side of pump body. Remove spring, piston and rotors from pump body. Thoroughly clean and inspect all components.

Fig. 8: Exploded View of Oil Pump



Inspection

1) Check rotor tip clearance. If tip clearance is more than limit, replace rotors. Check clearance between drive rotors and cover using a straightedge and feeler gauge. If clearance exceeds limit, replace cover, pump body or rotors.

2) Check clearance between outer rotor and pump body with feeler gauge. If more than limit replace pump body or rotors. Check pressure regulator spring and piston for wear or damage. Replace as necessary.

Reassembly

To assemble pump, reverse disassembly procedure. Install rotors with punch marks toward body (upward). With pump assembled, submerge in clean motor oil and rotate drive shaft to check flow of oil from outlet port.

OIL PUMP CLEARANCE SPECIFICATIONS

Application	In. (mm)
Rotor Tip Clearance	.002-.006 (.04-.16)
	Limit .008 (.2)
Rotor Side Clearance	.001-.004 (.03-.09)
	Limit .006 (.15)
Rotor-to-Body Clearance	.004-.006 (.10-.16)
	Limit .008 (.2)

4K-C 4-CYLINDER (Cont.)

ENGINE COOLING

COOLANT CAPACITY

The coolant capacity is 6.0 qts. (5.7L).

THERMOSTAT

Low Temperature Model

Begins to open at 177°F (80°C) and fully opens at 203°F (95°C).

High Temperature Model

Begins to open at 187°F (86°C) and fully opens at 212°F (100°C).

WATER PUMP

NOTE: Cooling fan is electrically driven and may run at any time the ignition is on if coolant temperature is high. It may be necessary to remove fan and shroud to provide greater access to the water pump.

Removal

Drain cooling system and loosen drive belt. Disconnect radiator and heater hoses at pump. Remove mounting bolts and take off water pump.

Disassembly

1) Press the pulley off of the pump shaft. Heat the pump body to about 176°F (80°C). Press the bearing-shaft-impeller assembly out of the rear of the pump.

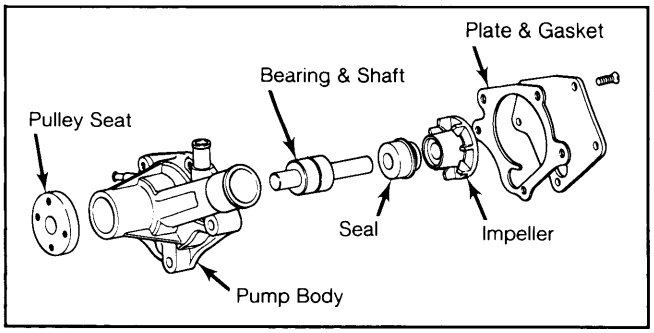
2) Press the impeller off of the pump shaft. Remove the seal from the pump shaft.

Reassembly

1) Heat pump body to 176°F (80°C). Press the bearing and shaft into the body. Bearing should be flush with the front edge of the neck of the body. Press in the seal and impeller. Rear face of body and impeller should be flush.

2) Press the pulley seat on the pump shaft to the specified depth. The pump shaft should protrude .283" (7.2 mm) above the front face of the pulley seat.

Fig. 9: Exploded View of Water Pump



Installation

To install, clean mating surfaces, coat new gasket with sealer and install water pump.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Cylinder Head Bolts	40-47 (55-64)
Manifold Nuts	15-21 (20-29)
Main Bearing Cap Bolts	40-47 (55-64)
Connecting Rod Cap Nuts	29-37 (39-50)
Camshaft Sprocket Bolt	40-47 (55-64)
Crankshaft Pulley Bolt	55-75 (75-102)
Flywheel Bolts	40-47 (55-64)
	INCH Lbs. (N.m)
Camshaft Thrust Plate Bolts	48-84 (5-10)

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Year	DISPLACEMENT		Fuel System	HP@RPM	Torque Ft. Lbs.@RPM	Compr. Ratio	BORE		STROKE	
	Cu. In.	cc					In.	mm	In.	mm
1982	78.7	1290	2-Bbl.	58@5200	67@3600	9.0:1	2.95	75	2.87	73

VALVES

Engine Size & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1290 cc							
Intake	.....	44.5°	45°	.043-.071 (1.1-1.8)	.3136-.3142 (7.965-7.980)	.0012-.0026 (.030-.065)	.....
Exhaust	.....	44.5°	45°	.047-.071 (1.2-1.8)	.3134-.3140 (7.960-7.975)	.0014-.0028 (.035-.070)	

Toyota Engines

4K-C 4-CYLINDER (Cont.)

ENGINE SPECIFICATIONS (Cont.)

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit In. (mm)	Ring No.	End Gap In. (mm)	Side Clearance In. (mm)
1290 cc	.0012-.0020 (.03-.05)	Thumb Pressure	.0002-.0003 (.004-.008)	No. 1	.0039-.0110 (.10-.28)	.0012-.0028 (.03-.07)
				No. 2	.0059-.0118 (.15-.30)	.0008-.0024 (.02-.06)
				Oil	.008-.035 (.2-.9)	.....

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1290 cc	1.9676-1.9685 (49.976-49.50.000)	.0006-.0016 (.016-.040)	No. 3	.0016-.0095 (.040-.242)	1.6526-1.6435 (41.976-42.000)	.0006-.0016 (.200-.304)	.0079-.0120

VALVE SPRINGS

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (Kg @ mm)	
		Valve Closed	Valve Open
1290 cc	1.831 (46.5)	70.1@1.512 (31.8@38.4)	.....

CAMSHAFT

Engine	Journal In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1290 cc			
No. 1	1.7011-1.7018 (43.209-43.225)	.0010-.0026 (.025-.066)	.....
No. 2	1.6911-1.6917 (42.954-42.970)	.0012-.0028 (.030-.071)	
No. 3	1.6813-1.6819 (42.704-42.720)	.0012-.0028 (.030-.071)	
No. 4	1.6716-1.6722 (42.459-42.475)	.0010-.0026 (.025-.066)	